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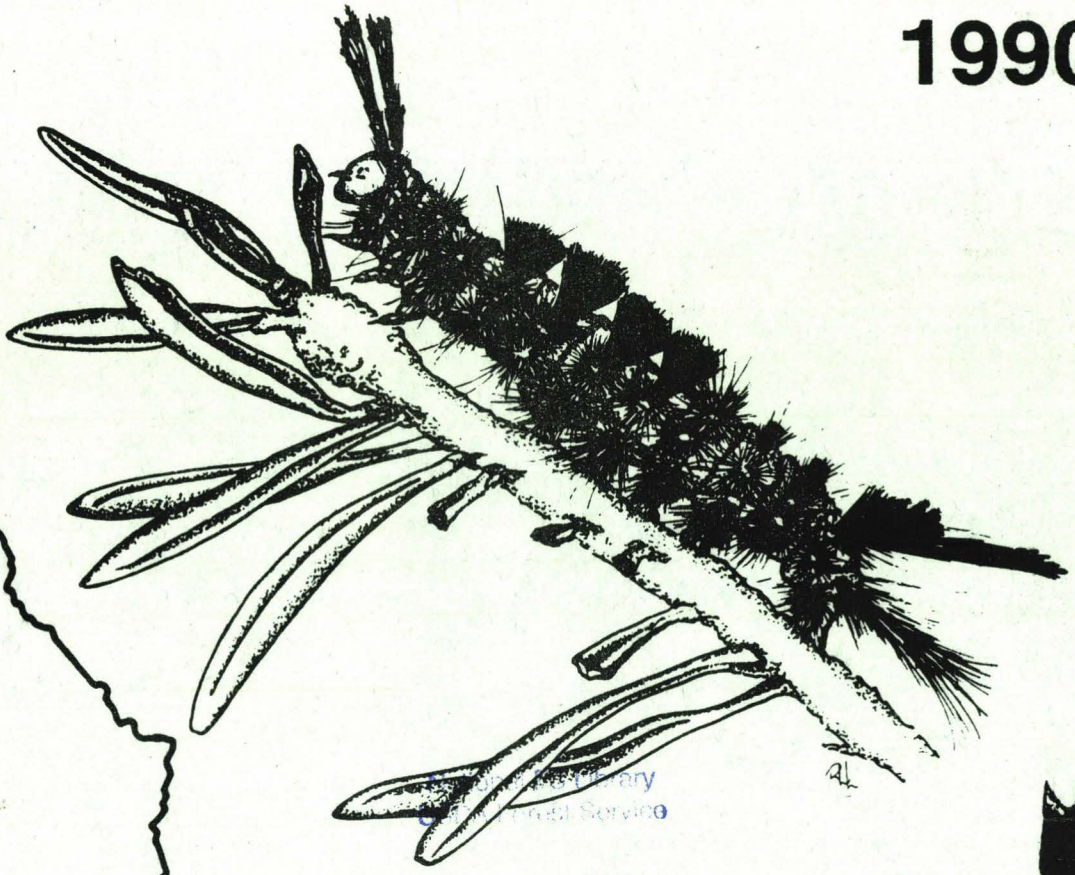
IDAHO FOREST PEST CONDITIONS & PROGRAM SUMMARY 1990



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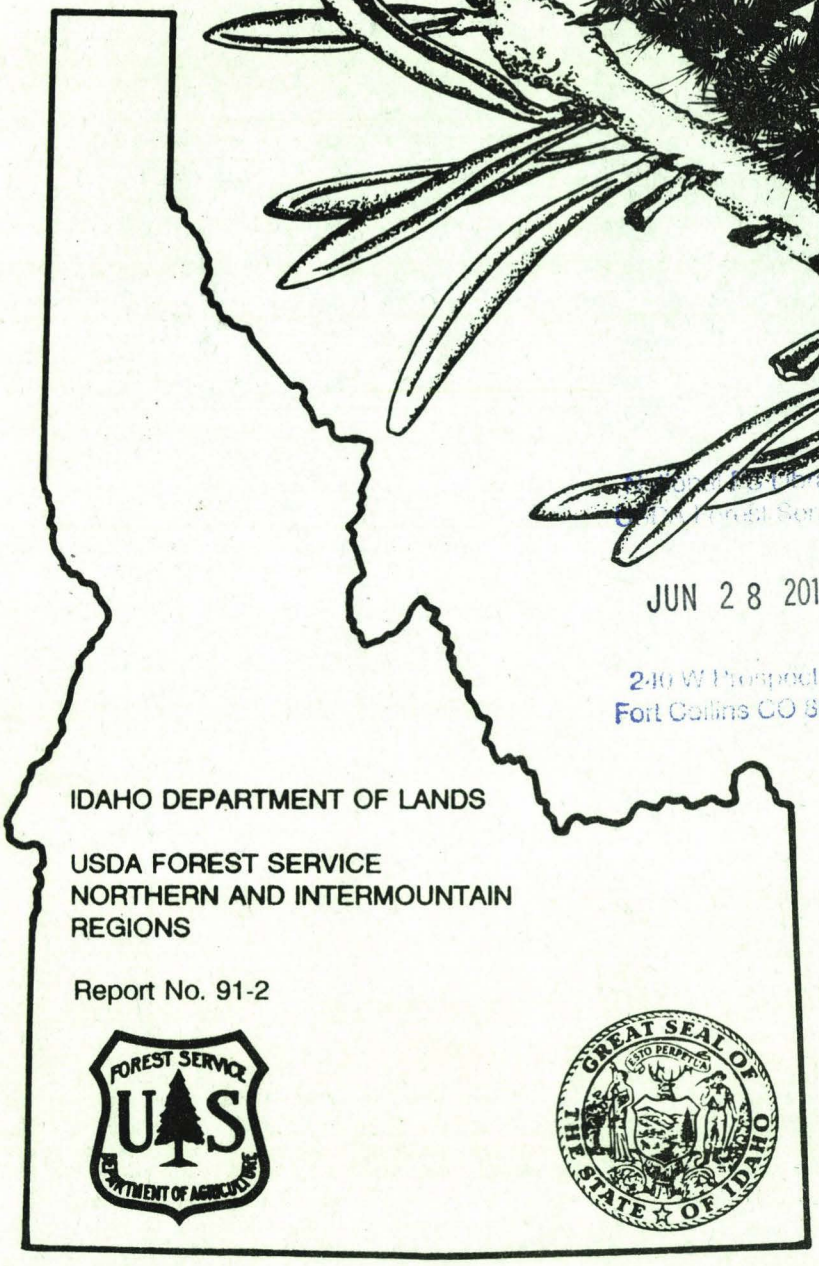

IDAHO DEPARTMENT OF LANDS

USDA FOREST SERVICE
NORTHERN AND INTERMOUNTAIN
REGIONS

Report No. 91-2

IDAHO FOREST PEST CONDITIONS
AND
PROGRAM SUMMARY
1990

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INTRODUCTION

This report summarizes major insect and disease damage on forested lands of all ownerships within the State of Idaho for 1990. Much of the information for this report was derived from aerial and ground surveys and associated detection and evaluation activities by pest management personnel within the USDA Forest Service and the Idaho Department of Lands. This report also describes several aspects of the pest management program for each of the agencies.

Losses outlined in tables are only estimates. Likewise, maps outlining areas of major insect infestations provide general locations of problems.

CONDITIONS IN BRIEF

INSECTS

Douglas-fir beetle infestations decreased by half in northern Idaho while high populations remained static in the southern part of the State. Mountain pine beetle activity decreased in both northern and southern Idaho with the lowest mortality by this beetle on record. Acres infested by the western pine beetle declined in northern Idaho, although significant infestations are still found south of the St. Joe River and the number of trees killed there have increased. Western pine beetle populations declined by 50 percent in southern Idaho. Grand fir mortality by the fir engraver beetle declined by two-thirds in northern Idaho, though over 36,000 acres remain infested. In southern Idaho, fir engraver and western balsam bark beetle populations more than doubled, killing over 100,000 true fir trees. Spruce beetles killed over 185,000 trees in southern Idaho in 1990 compared to just over 32,000 in 1989. A small spruce beetle outbreak is occurring on the Nez Perce National Forest (NF) in northern Idaho.

Defoliation by the western spruce budworm continued to decrease in northern Idaho but increased by about 41,000 acres on the Salmon NF in southern Idaho. Douglas-fir tussock moth populations remained low in northern Idaho while causing over 60,000 acres of defoliation in southern Idaho. This is the first tussock moth defoliation detected in southern Idaho since the early 1970's. The eradication project against gypsy moth was successful in Coeur d'Alene and Sandpoint. A total of six moths were caught in all of Idaho; three in Dover (approximately 2 miles west of Sandpoint) and three in Idaho Falls. Over 6,400 acres of western larch was defoliated in northern Idaho by an unidentified larch looper. The balsam woolly adelgid continued to cause considerable subalpine fir mortality in both low- and high-elevation stands in northern Idaho.

DISEASES

Root diseases, white pine blister rust, dwarf mistletoes, and nursery diseases continue to cause serious problems throughout much of the State. Aerial surveys do not usually record these diseases, although impacts may be quite severe. Rough estimates indicate that diseases are probably responsible for considerable volume loss, but mortality is not usually as apparent as insect outbreaks or forest fires, so the extent of disease impact may not be fully realized.

We are currently involved in many projects to help managers deal with diseases; brief summaries of these are included.

INSECTS

BARK BEETLES

Mountain Pine Beetle

With the exception of lodgepole pine stands on the Nez Perce NF, and to a lesser extent on the Bonners Ferry Ranger District (RD), Idaho Panhandle National Forests (IPNFs), pine stands in northern Idaho have not been seriously impacted by the mountain pine beetle in recent years. In 1990, what few populations had existed, declined (Table 1a; Figure 1). On the Nez Perce NF mountain pine beetle populations are now nearly endemic. On the Red River RD, 258 infested acres were detected. Only two infested acres remain on the Elk City RD. Within the Maggie Creek Fire Protection District (FPD), 154 total acres of faded lodgepole pines were observed. Minor numbers of faders were noted on several other reporting areas. A total of 572 acres of newly killed lodgepole pines were noted by aerial observers.

Other host species were affected to a lesser degree. A total of 162 acres of ponderosa pine mortality attributed to the beetle was recorded. Most of that was scattered over the Clearwater/Potlatch Timber Protective Association (CPTPA). A few widely scattered whitebark pines in high-elevation stands were killed by the mountain pine beetle. Likewise, only occasional western white pine mortality attributable to the beetle was observed.

Tree mortality caused by the mountain pine beetle decreased throughout southern Idaho with 9,300 lodgepole pine trees killed in 1990 compared to 36,800 trees in 1989 (Table 1b; Figure 1). This was the lowest mortality recorded since aerial detection surveys were begun in the early 1960's. Decreasing levels of mortality occurred throughout all infested areas. The largest infestation continued to be in the Sawtooth NF Recreation Area where 5,000 trees were killed. Smaller, less significant infestations were located in the Salmon, Challis, and Boise NFs.

Western Pine Beetle

Once again, improved moisture conditions in the northern part of north Idaho--generally north of the St. Joe River--resulted in a decline in western pine beetle populations and resultant damage to ponderosa pine stands in 1990. On the other hand, abnormally dry weather persisted in the southern portion of the Northern Region, and extended well into the Intermountain Region. As a result, beetle-caused mortality remained severe in those areas.

In total, for northern Idaho, the infested area declined from 18,300 acres in 1989, to fewer than 8,800 acres in 1990. However, the number of trees killed increased from 26,500 in 1989, to 41,400 in 1990 (Table 1a). Significant infestations are still found in the Craig Mountains, within the West St. Joe reporting area, and in the Mica FPD. Less serious outbreaks are located in the Maggie Cr. FPD and on the Nez Perce Indian Reservation (IR). Other infestations, particularly in the more northern part of the State, are scattered in smaller groups on drier sites.

Being more weather dependent than many bark beetle species, western pine beetle populations likely will respond to moisture received in 1991. Where precipitation is near normal, depredations from the beetle should continue to decline. Where dry weather persists, beetle-caused losses will do the same.

In southern Idaho, western pine beetle activity, often in conjunction with the pine engraver, decreased more than 50 percent from 1989 levels. Nearly 24,000 trees were killed in 1990, compared to about 53,000 in 1989 (Table 1b). Activity was located on the Boise and Payette NFs and affected primarily second-growth ponderosa pine.

Table 1a.--Idaho State-wide summary; annual bark beetle mortality by reporting area: North Idaho

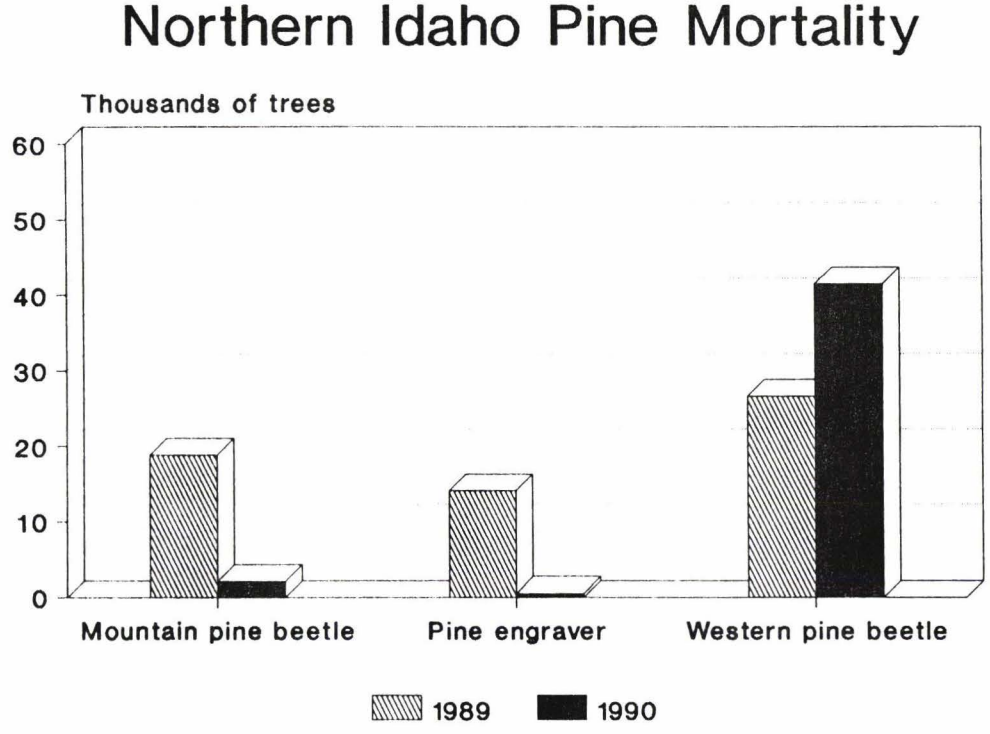
		--MOUNTAIN PINE BEETLE-- ESTIMATED MORTALITY			----PINE ENGRAVER---- ESTIMATED MORTALITY			--WESTERN PINE BEETLE-- ESTIMATED MORTALITY		
Area	Year	Acres Infested	Trees	MBM Volume	Acres Infested	Trees	MBM Volume	Acres Infested	Trees	MBM Volume
Bitterroot NF	1990	0	0	0.0	0	0	0.0	0	0	0.0
	1989	15	156	14.0	0	0	0.0	0	0	0.0
Cataldo	1990	37	95	8.5	0	0	0.0	4	25	10.0
	1989	143	232	20.9	1	10	0.3	150	103	41.2
Clearwater NF	1990	10	11	3.1	0	0	0.0	28	205	82.0
	1989	264	103	8.2	0	0	0.0	72	107	42.8
CPTPA	1990	130	175	14.8	0	0	0.0	518	2,920	1,168.0
	1989	1	10	4.0	0	0	0.0	2,014	4,472	1,788.8
Craig Mtns.	1990	16	105	9.4	5	90	2.3	2,059	7,785	3,114.0
	1989	12,159	12,333	1,069.2	126	25	0.6	5,291	8,799	3,519.6
IPNFs	1990	147	352	43.4	268	250	6.3	342	897	358.8
	1989	613	1,866	170.9	30	205	5.1	2,269	609	243.6
Kendrick	1990	0	0	0.0	0	0	0.0	897	4,725	1,890.0
	1989	0	0	0.0	4,611	5,717	142.9	624	1,156	462.4
Kootenai Valley	1990	0	0	0.0	0	0	0.0	0	0	0.0
	1989	0	0	0.0	0	0	0.0	0	0	0.0

Table 1a.--Idaho State-wide summary; annual bark beetle mortality by reporting area: North Idaho, cont.

		--MOUNTAIN PINE BEETLE-- ESTIMATED MORTALITY			----PINE ENGRAVER---- ESTIMATED MORTALITY			--WESTERN PINE BEETLE-- ESTIMATED MORTALITY		
Area	Year	Acres Infested	Trees	MBM Volume	Acres Infested	Trees	MBM Volume	Acres Infested	Trees	MBM Volume
Maggie Cr.	1990	154	250	22.5	0	0	0.0	1,133	16,331	6,532.4
	1989	135	250	100.0	0	0	0.0	251	735	294.0
Mica	1990	0	0	0.0	0	0	0.0	1,453	3,777	1,510.8
	1989	21	132	11.9	1,535	2,950	73.8	2,944	4,865	1,946.0
Nez Perce NF	1990	280	1,095	99.4	41	210	5.3	661	978	391.2
	1989	813	3,400	306.0	1,027	1,978	49.5	3,501	3,804	1,521.6
Pend Oreille	1990	4	7	0.6	0	0	0.0	118	590	236.0
	1989	933	325	26.2	326	1,250	31.3	239	339	135.6
Priest Lake	1990	0	0	0.0	0	0	0.0	2	10	4.0
	1989	0	0	0.0	0	0	0.0	0	0	0.0
West St. Joe	1990	0	0	0.0	0	0	0.0	1,546	3,205	1,282.0
	1989	0	0	0.0	1,197	1,903	47.6	991	1,547	618.8
N. Idaho	1990	778	2,090	201.7	314	550	13.9	8,761	41,448	16,579.2
Totals	1989	15,097	18,807	1,731.3	8,853	14,038	751.1	18,346	26,536	10,614.4

Table 1b.--Idaho State-wide summary; annual bark beetle mortality by reporting area: South Idaho

		--MOUNTAIN PINE BEETLE-- ESTIMATED MORTALITY			----PINE ENGRAVER---- ESTIMATED MORTALITY			--WESTERN PINE BEETLE-- ESTIMATED MORTALITY		
Area	Year	Acres Infested	Trees	MBM Volume	Acres Infested	Trees	MBM Volume	Acres Infested	Trees	MBM Volume
Boise	1990	400	445	28.5	0	0	0.0	25,460	18,150	9,982.5
	1989	791	880	56.3	0	0	0.0	59,888	42,686	23,477.3
Caribou	1990	0	0	0.0	0	0	0.0	0	0	0.0
	1989	378	636	40.7	0	0	0.0	0	0	0.0
Challis	1990	3,660	2,320	148.5	0	0	0.0	0	0	0.0
	1989	10,586	6,703	429.0	0	0	0.0	0	0	0.0
Payette	1990	0	0	0.0	0	0	0.0	14,720	5,680	3,124.0
	1989	603	367	23.5	27,151	10,476	104.8	27,151	10,476	5,761.8
Salmon	1990	1,420	1,360	87.0	0	0	0.0	0	0	0.0
	1989	5,859	6,111	391.1	0	0	0.0	0	0	0.0
Sawtooth	1990	2,730	5,070	324.5	0	0	0.0	0	0	0.0
	1989	6,630	12,399	793.5	0	0	0.0	0	0	0.0
Targhee	1990	0	0	0.0	0	0	0.0	0	0	0.0
	1989	1,536	2,486	159.1	0	0	0.0	0	0	0.0
South Idaho	1990	8,210	9,195	588.5	0	0	0.0	40,180	23,830	13,106.5
	1989	26,383	29,582	1,893.2	27,151	10,476	104.8	87,039	53,162	29,239.1
State Totals	1990	8,988	11,285	790.2	314	550	13.9	48,941	65,278	29,685.7
	1989	41,480	48,389	3,624.5	36,004	24,514	455.9	105,385	79,698	39,853.5



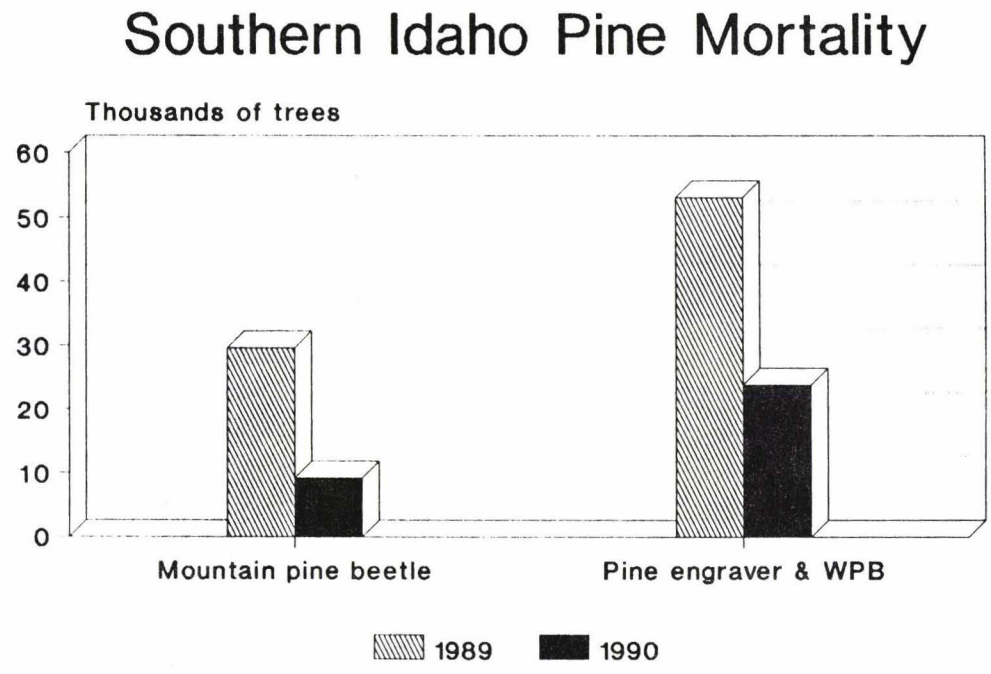


Figure 1. Northern and Southern Idaho Pine Mortality by Bark Beetle Species 1989 - 1990

Pine Engraver

In northern Idaho, the number of trees killed by the pine engraver in 1990 was markedly reduced from the level observed in 1989. Only 550 trees were killed on 314 acres (Table 1a). Most of those affected acres were on the Priest Lake RD, IPNFs, and occurred in two large groups of trees west of Priest Lake. The significant reduction in infested acres was likely a result of moisture received in 1990, and may also have been associated with improved slash treatment at logging sites.

Douglas-fir Beetle

In response to improved precipitation and increased sanitation\salvage efforts, the area affected by Douglas-fir beetle in northern Idaho decreased by about half in 1990. In 1989, nearly 16,000 acres had harbored some level of beetle activity. Aerial survey estimates in 1990 showed only slightly more than 8,000 acres still infested (Table 2a; Figure 2). The reporting area most seriously affected remained on the IPNFs. There, almost 3,600 acres showed some level of beetle activity. That, however, was but one-third of the nearly 11,000 acres recorded in 1989. The Nez Perce NF was the next most severely impacted area with just over 2,000 acres infested. The Clearwater NF and the Clearwater\Potlatch FPD, each with about 900 acres, were also significantly affected. Other areas in the northern part of the State exhibited small and widely scattered groups of beetle-killed trees.

Ground surveys conducted in infested areas indicated that, with few exceptions, beetle populations are rapidly returning to endemic conditions. Data collected in 38 infested stands showed only 28 percent as many trees attacked in 1990 as were attacked in 1989. Likewise, brood counts exhibit a decidedly declining trend. We anticipate that unless there is a significant return to dry conditions, beetle populations will continue to wane.

Because of the prevalence of root-disease-affected hosts in northern Idaho, there will always be relatively high endemic populations of Douglas-fir beetle in the area. Major stand disturbances, or additional stress-producing factors of any type, will likely result in a return to unacceptably high beetle-caused mortality.

Static epidemic levels of Douglas-fir beetle activity were noted throughout forests in southern Idaho with 164,700 trees killed in 1990, compared to 170,500 in 1989 (Table 2b). All forests in southern Idaho have significant areas of host type infested. The Boise NF has the largest infestation with 62,415 trees killed, a small decrease from 1989 mortality levels.

Fir Engraver

As with the western pine beetle, fir engraver populations are to a large extent weather related. Likewise, acres infested were reduced markedly where moisture was nearly normal, and remained high where dry conditions continued. Overall, the infested area in northern Idaho was reduced by nearly two-thirds in 1990. About 36,600 acres are still infested with a total of 53,000 trees killed in 1990, compared to over 127,000 trees killed in 1989 (Table 2a). Mortality averaged less than two trees per acre in 1990.

The most severely affected areas are stands within the Craig Mountains where almost 16,000 trees were killed, and the Clearwater\Potlatch FPD where nearly 14,000 trees were killed. Another 4,000 trees were killed on the Nez Perce NF. The remainder of the observed mortality was recorded in scattered groups of 10 to 20 trees.

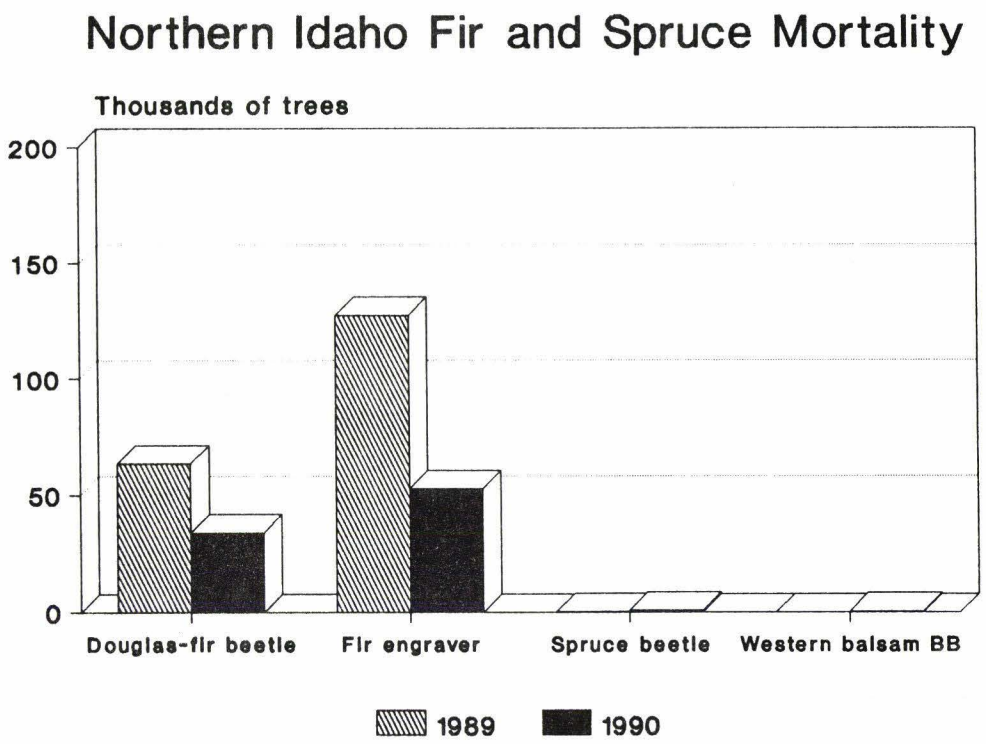
Though associated with dry weather, there is also a direct correlation between presence of beetles and root diseases. Because of that association, there will no doubt be high endemic populations of the fir engraver throughout much of northern Idaho even after the drought subsides.

Table 2a.--Idaho State-wide summary; annual bark beetle mortality by reporting area: North Idaho

		--DOUGLAS-FIR BEETLE-- ESTIMATED MORTALITY			---SPRUCE BEETLE--- ESTIMATED MORTALITY			----FIR ENGRAVER---- ESTIMATED MORTALITY			-WESTERN BALSAM- -BARK BEETLE- ESTIMATED MORTALITY		
Area	Year	Acres Infested	Trees	MBM Volume	Acres Infested	Trees	MBM Volume	Acres Infested	Trees	MBM Volume	Acres Infested	Trees	MBM Volume
Bitterroot NF	1990	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
	1989	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
Cataldo	1990	111	495	173.3	0	0	0.0	78	387	77.4	0	0	0.0
	1989	244	775	271.3	0	0	0.0	40	169	33.8	0	0	0.0
Clearwater NF	1990	966	5,075	1,776.3	4	6	2.4	257	825	165.0	0	0	0.0
	1989	1,686	7,014	2,454.9	1	1	0.4	1,132	1,282	256.4	0	0	0.0
CPTPA	1990	897	4,741	1,659.3	0	0	0.0	10,660	13,883	2,776.6	0	0	0.0
	1989	536	2,924	1,023.4	0	0	0.0	32,996	45,560	9,112.0	0	0	0.0
Craig Mtns.	1990	14	105	36.8	0	0	0.0	17,466	15,883	3,176.6	0	0	0.0
	1989	573	481	168.3	52	50	20.0	16,624	17,357	3,471.4	0	0	0.0
IPNFs	1990	3,584	15,089	5,281.1	2	1	0.4	1,277	3,760	752.0	0	0	0.0
	1989	10,417	41,718	14,601.3	3	19	7.6	4,340	9,524	1904.8	0	0	0.0
Kendrick	1990	104	460	161.0	0	0	0.0	709	3,723	744.6	0	0	0.0
	1989	5	50	17.5	2	20	8.0	137	320	64.0	0	0	0.0
Kootenai Valley	1990	0	0	0.0	0	0	0.0	6	50	10.0	0	0	0.0
	1989	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
Maggie Cr.	1990	92	407	142.4	0	0	0.0	642	2,601	520.2	0	0	0.0
	1989	33	320	112.0	0	0	0.0	2,455	3,665	733.0	0	0	0.0
Mica	1990	52	159	55.6	0	0	0.0	791	2,150	430.0	0	0	0.0
	1989	79	549	192.1	0	0	0.0	5,255	8,379	1675.8	0	0	0.0
Nez Perce NF	1990	2,043	6,539	2,288.6	585	795	318.0	3,190	4,681	936.2	63	130	14.3
	1989	1,755	6,426	2,249.1	249	217	86.8	911	3,919	783.8	0	0	0.0

Table 2a.--Idaho State-wide summary; annual bark beetle mortality by reporting area: North Idaho, cont.

		--DOUGLAS-FIR BEETLE-- ESTIMATED MORTALITY			---SPRUCE BEETLE--- ESTIMATED MORTALITY			----FIR ENGRAVER---- ESTIMATED MORTALITY			--WESTERN BALSAM-- --BARK BEETLE-- ESTIMATED MORTALITY		
Area	Year	Acres Infested	Trees	MBM Volume	Acres Infested	Trees	MBM Volume	Acres Infested	Trees	MBM Volume	Acres Infested	Trees	MBM Volume
Pend Oreille	1990	35	165	57.7	0	0	0.0	598	508	101.6	0	0	0.0
	1989	212	1,288	450.8	0	0	0.0	3,841	8,065	1613.0	0	0	0.0
Priest Lake	1990	58	260	91.0	0	0	0.0	24	110	22.0	54	195	21.4
	1989	3	45	15.7	0	0	0.0	1	25	5.0	0	0	0.0
West St. Joe	1990	95	480	168.0	0	0	0.0	896	4,068	813.6	0	0	0.0
	1989	363	1,880	658.0	0	0	0.0	21,565	29,085	5817.0	0	0	0.0
N. Idaho	1990	8,051	33,975	11,891.1	591	802	320.8	36,594	52,629	10,525.8	117	325	35.7
Totals	1989	15,906	63,470	22,214.4	307	307	122.8	89,297	127,350	25,470.0	0	0	0.0



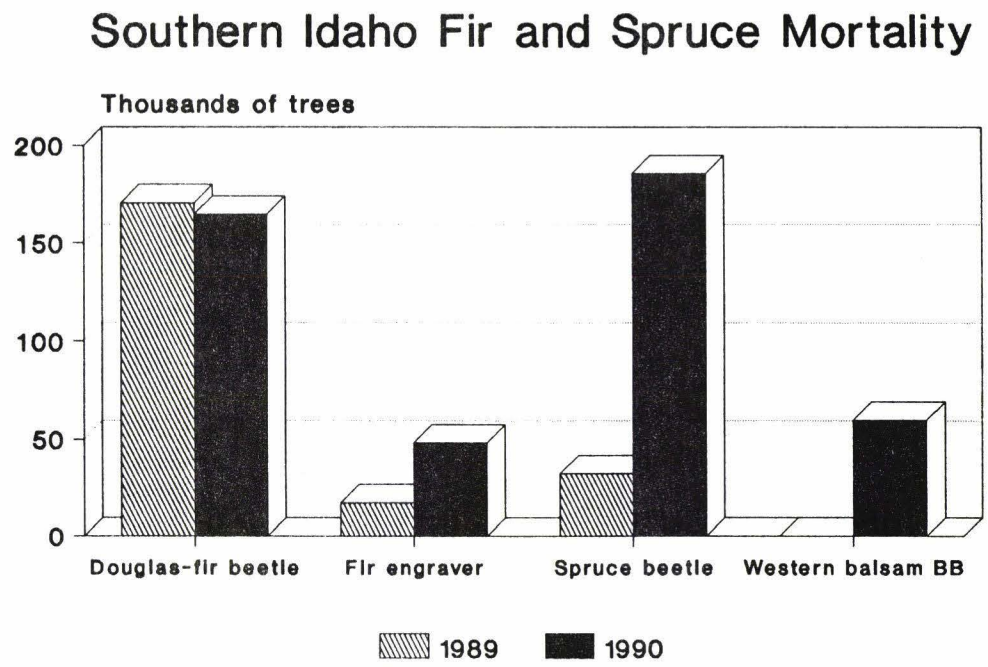


Figure 2. Northern and Southern Idaho
Fir and Spruce Mortality
by Bark Beetle Species 1989 - 1990

Table 2b.--Idaho State-wide summary; annual bark beetle mortality by reporting area: South Idaho

		--DOUGLAS-FIR BEETLE-- ESTIMATED MORTALITY			--SPRUCE BEETLE-- ESTIMATED MORTALITY			---FIR ENGRAVER--- ESTIMATED MORTALITY			--WESTERN BALSAM-- --BARK BEETLE-- ESTIMATED MORTALITY		
Area	Year	Acres Infested	Trees	MBM Volume	Acres Infested	Trees	MBM Volume	Acres Infested	Trees	MBM Volume	Acres Infested	Trees	MBM Volume
Boise	1990	59,400	62,415	8862.9	100	40	19.1	73,450	30,690	5831.1	0	0	0.0
	1989	69,231	72,729	10327.5	175	227	108.5	41,311	17,260	3279.4	0	0	0.0
Caribou	1990	31,020	41,960	5958.3	0	0	0.0	0	0	0.0	22,970	35,850	3943.5
	1989	23,402	31,652	4494.6	0	0	0.0	0	0	0.0	0	0	0.0
Challis	1990	6,350	6,615	939.3	0	0	0.0	0	0	0.0	0	0	0.0
	1989	1,227	1,279	181.6	0	0	0.0	0	0	0.0	0	0	0.0
Payette	1990	27,115	18,535	2632.0	152,810	185,460	88,649.9	0	16,801	3192.2	0	0	0.0
	1989	37,711	25,779	3660.6	26,451	32,108	15,347.6	0	0	0.0	0	0	0.0
Salmon	1990	9,060	11,095	1575.5	0	0	0.0	0	0	0.0	0	0	0.0
	1989	7,929	9,708	1378.5	0	0	0.0	0	0	0.0	0	0	0.0
Sawtooth	1990	9,630	12,505	1775.7	0	0	0.0	1,120	830	157.7	0	0	0.0
	1989	12,362	16,052	2279.4	0	0	0.0	0	0	0.0	0	0	0.0
Targhee	1990	7,240	11,590	1645.8	0	0	0.0	0	0	0.0	13,110	24,085	2649.3
	1989	8,309	13,297	1888.2	0	0	0.0	0	0	0.0	0	0	0.0
S. Idaho Totals	1990	149,815	164,715	23,389.5	152,910	185,500	88,669.0	74,570	48,321	9,181.0	36,080	59,935	6592.8
	1989	160,171	170,496	24,210.4	26,626	32,335	15,456.1	41,311	17,260	3,279.4	0	0	0.0
State Totals	1990	157,866	198,690	35,280.6	153,501	186,302	88989.8	111,164	100,950	19,706.8	36,197	60,260	6,628.5
	1989	176,077	233,966	46,424.8	26,933	32,642	15578.9	130,608	144,610	28,749.4	0	0	0.0

In southern Idaho, the fir engraver killed over 48,000 trees in 1990 compared to 17,000 trees in 1989 (Table 2b). The primary host for the fir engraver is grand fir. The western balsam bark beetle infests subalpine fir throughout the host range in southern Idaho. Because of some overlapping and intermixed host range and subsequently infested areas, tree mortality caused by these two beetles may have been grouped together during aerial detection surveys. Increases in mortality due to the fir engraver occurred on the Boise and Payette NFs.

Western Balsam Bark Beetle

Subalpine fir mortality, attributed to the western balsam bark beetle, fluctuates from year to year, and is most likely associated with root disease infections. Quite likely, other bark beetle species are also a part of a complex of pests killing trees in these high-elevation stands. Mortality recorded in 1990 was widely scattered, but totaling only 325 trees on 117 acres in northern Idaho (Table 2a). Most was found on the Nez Perce NF and Priest Lake FPD.

In southern Idaho, the western balsam bark beetle killed nearly 60,000 trees in 1990 (Table 2b). The mortality occurred on the Caribou and Targhee NFs.

Spruce Beetle

Spruce beetle activity in northern Idaho remained endemic except for one small outbreak on the southern portion of the Nez Perce NF. That infestation, located in the southwest portion of the Hells Canyon Recreation Area, is likely an expansion of the serious spruce beetle infestation on the Payette NF just to the south. A total of 591 acres were infested, but they occur in small, scattered groups of 20-50 trees. Only 800 dead trees were recorded (Table 2a).

In southern Idaho, spruce beetles killed 185,500 trees in 1990 compared to 32,300 trees killed in 1989 (Table 2b). This increase can be attributed to a high mortality rate of smaller diameter trees on the Payette NF. Elsewhere, only small, isolated infestations were detected.

Silver Fir Beetle

Unusually large populations of the silver fir beetle in conjunction with the fir root bark beetle were detected overwintering in grand fir trees from Smith's Ferry to McCall in southern Idaho.

DEFOLIATORS

Western Spruce Budworm

In northern Idaho, western spruce budworm defoliation continued to decrease on the Salmon River RD, Nez Perce NF from approximately 16,000 acres in 1989 to just over 5,000 acres in 1990 (Table 3; Figure 3). The average number of egg masses per square meter of foliage decreased from 2.24 in 1989, to 1.74 in 1990 for 20 plots.

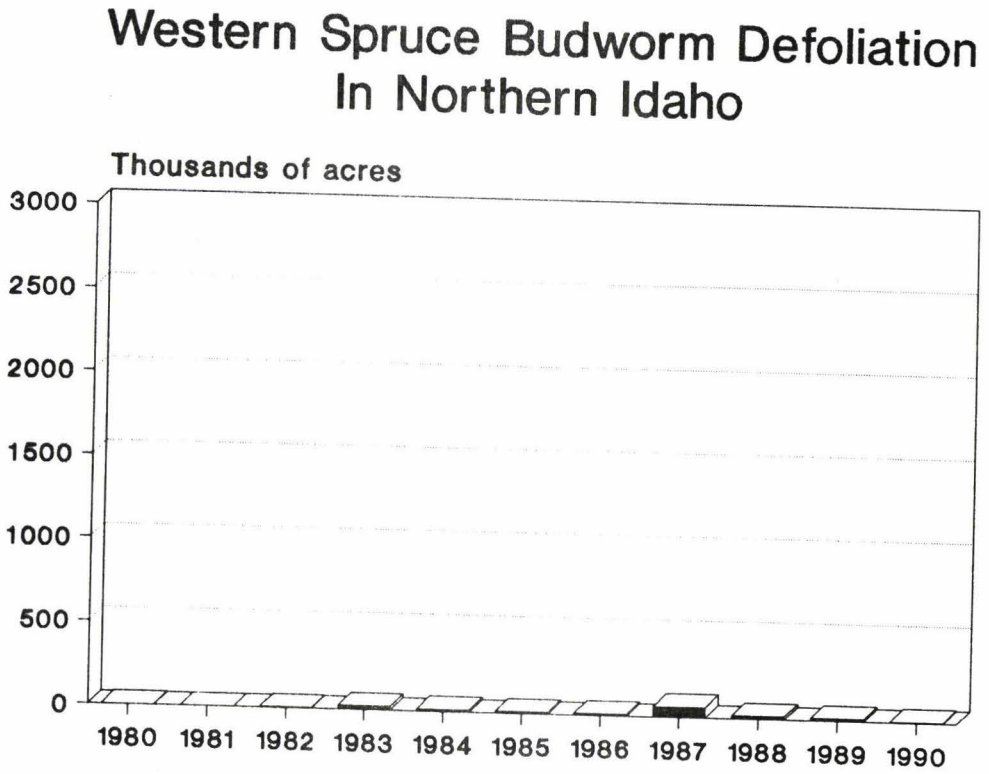
In southern Idaho, defoliation by western spruce budworm increased significantly with 42,600 acres observed in 1990 compared to 10,900 acres in 1989. Defoliation in 1990 increased on the Salmon and Challis NFs and decreased on the Targhee NF. Most defoliation was classified as light to moderate.

Douglas-fir Tussock Moth

No aerially visible defoliation due to the Douglas-fir tussock moth was found in northern Idaho in 1990. Pheromone trapping detection surveys were conducted and trap counts were, in general, still very low, but

Table 3.--Acres of western spruce budworm defoliation as determined by aerial surveys in 1989 and 1990.

		Defoliation Intensity				
Forest and adjacent lands	Year	Light	Moderate	Heavy	Total	Change
Bitterroot	1989	0	0	0	0	
	1990	0	0	0	0	0
Boise	1989	0	0	0	0	
	1990	0	0	0	0	0
Caribou	1989	0	0	0	0	
	1990	0	0	0	0	0
Challis	1989	248	0	0	248	
	1990	314	441	0	755	+ 507
Nez Perce	1989	15,321	22	539	15,882	
	1990	3,856	1,517	0	5,373	- 10,509
Payette	1989	0	0	0	0	
	1990	0	0	0	0	0
Salmon	1989	288	0	0	288	
	1990	36,149	4,384	1,304	41,837	+ 41,549
Sawtooth	1989	0	0	0	0	
	1990	0	0	0	0	0
Targhee	1989	10,340	0	0	10,340	
	1990	0	0	0	0	- 10,340
Total	1989	26,197	22	539	26,758	
	1990	40,319	6,342	1,304	47,965	+ 21,207



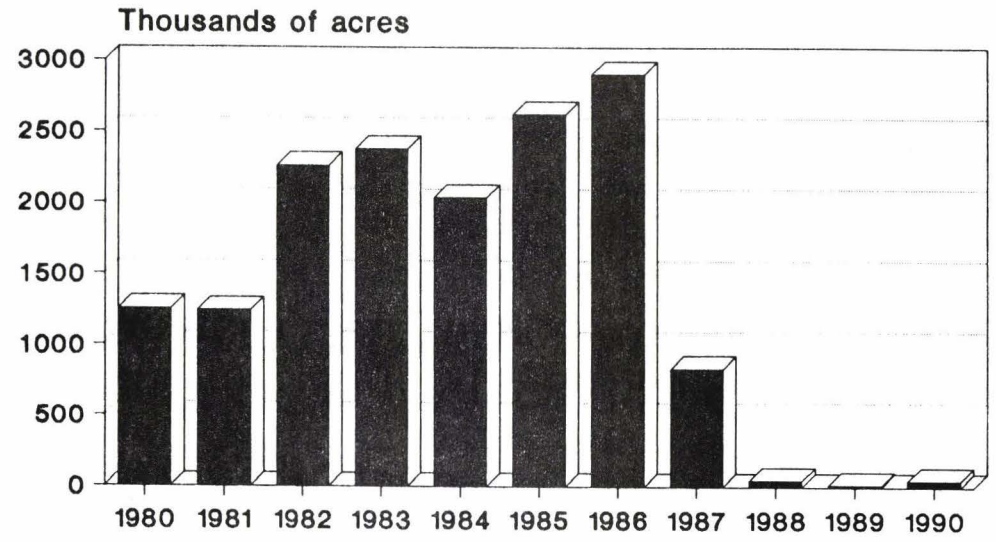


Fig 3. Acres of Western Spruce Budworm as Determined by Aerial surveys in Northern and Southern Idaho 1989 - 1990

showed a marked increase over the past few years (Table 4; Figure 4). In the Coeur d'Alene Mountain area, trapcatches increased significantly to the near sub-outbreak levels of 4 or 5 years ago (Figure 4). Larval sampling was conducted at several sites as part of the early warning system. Larval populations were very low at most sample sites.

Douglas-fir tussock moth defoliation has been seen on numerous ornamental trees in and around the Cities of Coeur d'Alene, St. Maries, Post Falls, Hayden, and Dalton. Ornamental spruce trees at the USDA Forest Service Nursery in Coeur d'Alene were also defoliated again this year. Spraying with the nuclear polyhedrosis virus (NPV), which is specific for tussock moths, and an experimental pheromone treatment for mating disruption, will hopefully bring their population under control.

In southern Idaho, for the first time since the early 1970's, significant defoliation by the Douglas-fir tussock moth was detected. On the Boise, Sawtooth, and Payette NFs, 50,700 acres of Douglas-fir and subalpine fir were defoliated. Defoliation was classified as mostly moderate to heavy. Approximately 900 acres of Douglas-fir were lightly defoliated in the Owyhee Mountains south of Boise.

Gypsy Moth

For the second consecutive year, Idaho Department of Lands, with Forest Service assistance, conducted an eradication project against the gypsy moth in Coeur d'Alene and Sandpoint. Infested areas were treated with three applications of the bio-insecticide *Bacillus thuringiensis* (Bt) followed up with a mass trapping effort. A total of 1,060 acres were treated. No moths were caught in the treatment areas indicating that the eradication program was probably successful. We do not anticipate a need for additional spray treatments in 1991.

Approximately 9,300 gypsy moth pheromone traps were placed thoughout Idaho in 1990. Trap placement was a cooperative effort involving State and Federal agencies. Three moths were caught in the City of Dover, approximately 2 miles west of Sandpoint, and three moths were caught in Idaho Falls. Mass trapping and detection trapping will continue in 1991.

Pine Butterfly

Large numbers of pine butterfly adults were again observed in ponderosa pine trees around Post Falls, Coeur d'Alene, and Sandpoint. No defoliation was observed.

Larch Looper

Larch defoliation was detected by aerial surveys for the first time in several years on over 6,400 acres in northern Idaho. Ground examination revealed mature larch trees completely defoliated by an unidentified larch looper.

Ponderosa Pine Needleminer

Mining of older ponderosa pine needles on approximately 800 acres near Featherville in southern Idaho was detected during aerial surveys.

Boxelder Leafroller

Boxelder trees along the Salmon River in the vicinity of Salmon, Idaho, were heavily infested with a boxelder leafroller.

Table 4.--Average Douglas-fir tussock moth pheromone trap catches in Idaho, 1980-1990.

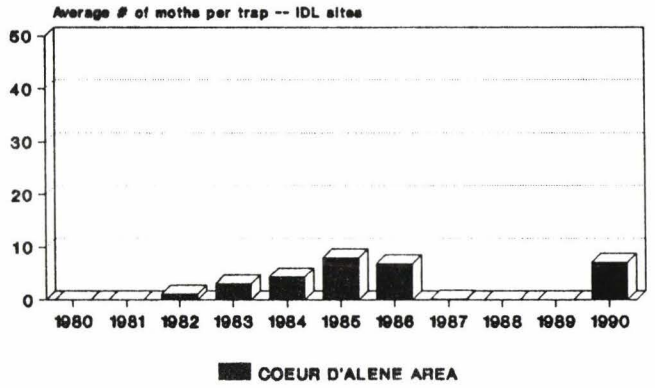
Area	Number of 1990 sample plots	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
STATE AND PRIVATE												
Coeur d'Alene	2	0	0	1.1	3.1	4.4	8.0	7.0	.2	0	0	7.2
Plummer-Moscow	13	0	.8	8.2	12.3	17.5	85.8	22.6	1.2	.02	0	.03
Plummer-Moscow	14	*	*	2.5	3.3	7.0	43.2	15.2	3	0	0	.06
Plummer-Moscow	9	*	*	*	4.3	9.0	35.2	14.6	.5	0	0	.1
Plummer-Moscow	1	*	*	*	*	36.43	68.4	42.8	1.0	0	0	0
Plummer-Moscow	1	*	*	*	*	*	76.0	49.7	3.8	0	0	0
Plummer-Moscow	1	*	*	*	*	*	80.5	9.0	.2	0	.2	
Craig Mountain	7	*	2.7	.5	.5	.6	.4	3.5	.1	0	0	.2
NEZ PERCE NF												
Selway RD	4	.2	1.2	.7	.1	.1	0	.1	0	0.5	.4	
Slate Creek RD	3	0	1.6	2.8	.6	1.4	.3	.9	0	0	0	.1
CLEARWATER NF												
Lochsa RD	2	*	3.6	.2	0	0	0	.3	0	0	0.2	0
Canyon RD	3	*	2.23	7.4	*	*	0.9	1.7	0	0	0	.2
Pierce RD	7	*	3.6	3.0	.1	.1	.6	4.0	.1	.06	0	.3
BOISE NF												
Cascade RD	1	*	.1	.3	20.0	0	1.0	1.2	.2	0.2	0	31.6
Mountain Home RD	1	*	*	.3	21.7	.4	0	1.2	1.4	0.6	0.2	5.3
Boise RD	1	*	*	*	*	*	*	*	*	*	*	65.6

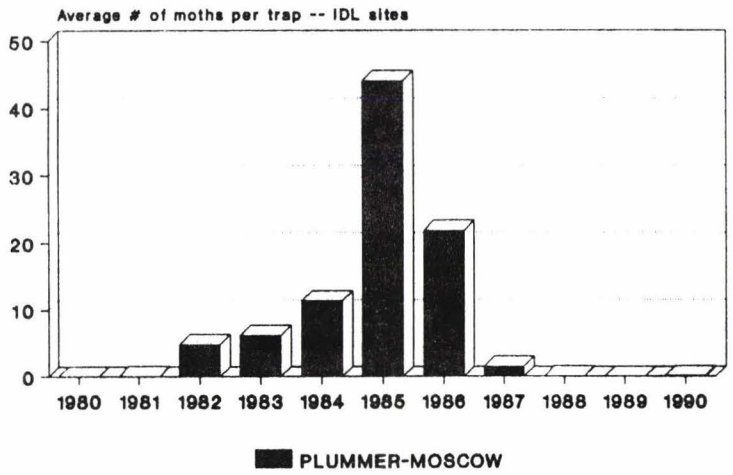
Table 4.--Average Douglas-fir Tussock moth pheromone trap catches in Idaho, 1980-1990, cont.

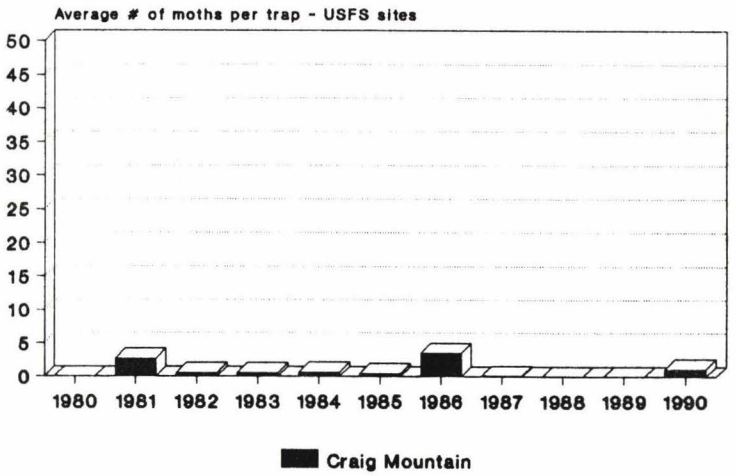
Area	Number of 1990 sample plots	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
PAYETTE NF												
Council RD	4	*	*	43.3	38.2	6.7	5.1	21.2	7.4	1.9	0.7	23.2
Weiser RD	5	*	*	43.3	42.1	8.1	4.1	15.2	5.2	0.7	0.8	67.0
SALMON NF												
North Fork RD	2	*	*	11.4	38.7	1.9	*	6.6	2.9	21.3	0.6	0.4
SAWTOOTH NF												
Fairfield RD	2	*	1.6	5.2	20.3	6.3	0	19.7	13.3	3.3	16.5	80.3
OTHER												
Owyhee Mountains	4	27.8	55.8	*	*	10.8	.6	9.4	7.8	15.8	12.8	75.5
Sharps Canyon	1	*	19.4	16.2	41.2	1.3	5.2	22.6	8.4	36.4	9.2	53.2

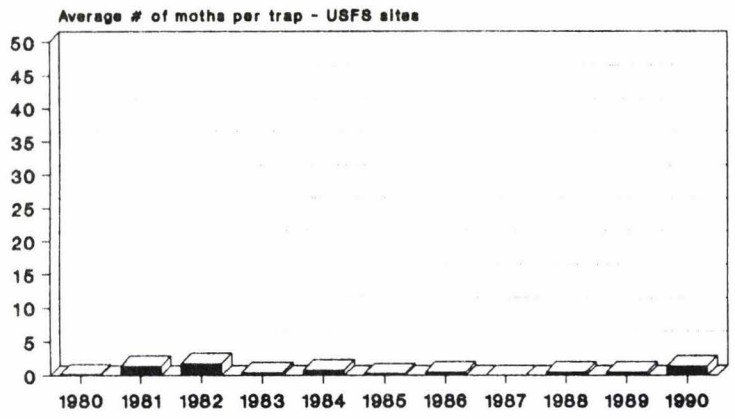
*Indicates no traps were deployed.

DOUGLAS-FIR TUSSOCK MOTH
PHEROMONE TRAP CATCHES IN NORTH IDAHO









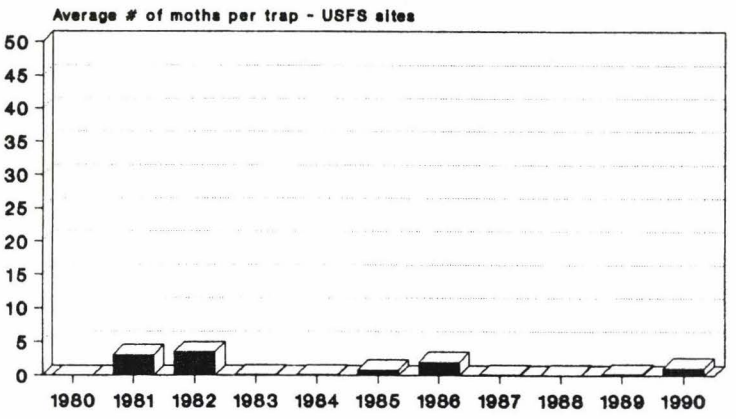
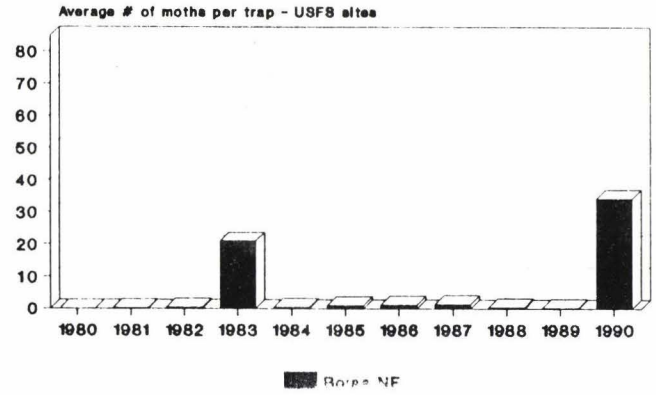
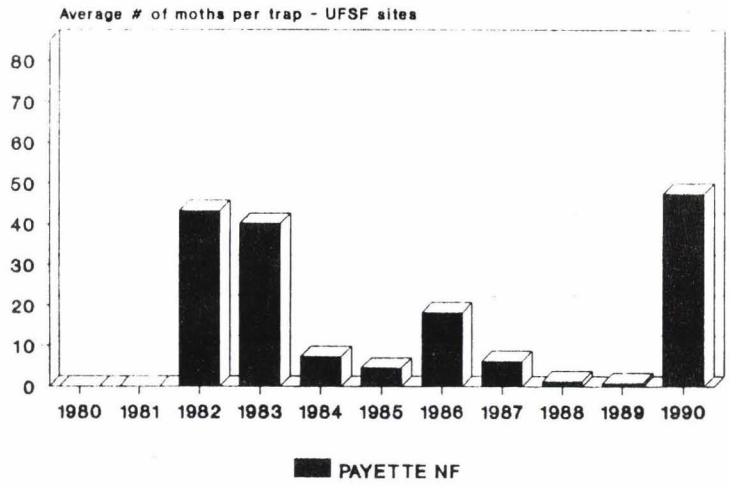
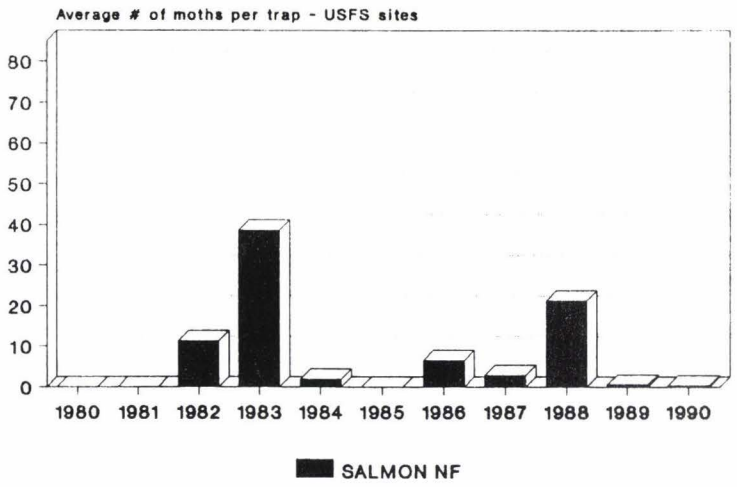


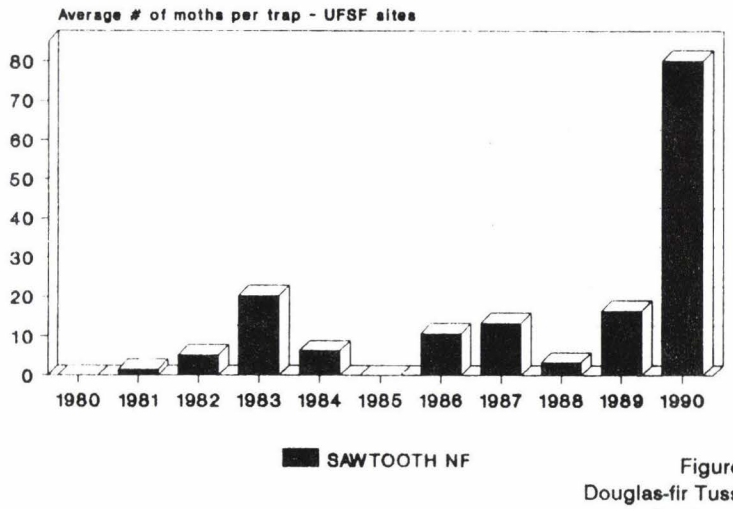
Figure 4.--USFS and IDL
Douglas-fir Tussock Moth Trap Catches
in North Idaho 1980 - 1990

DOUGLAS-FIR TUSSOCK MOTH
PHEROMONE TRAP CATCHES IN SOUTH IDAHO









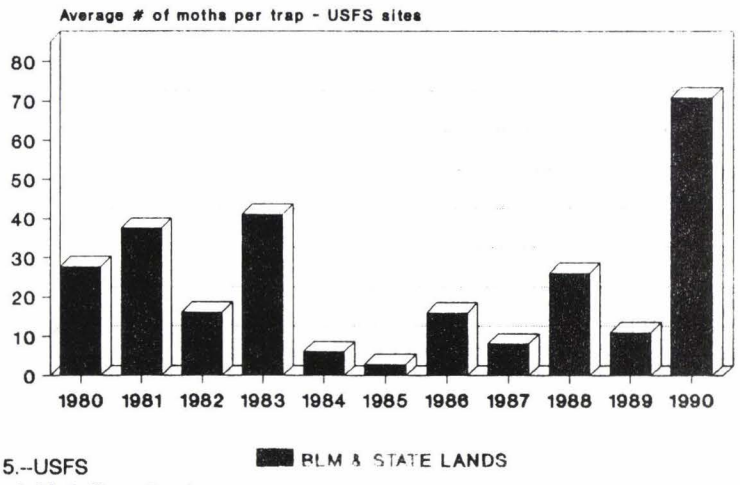


Figure 5.--USFS
Douglas-fir Tussock Moth Trap Catches
in Southern Idaho 1980 - 1990

MISCELLANEOUS INSECTS

Western Pine Shoot Borer

Treatment with an artificial sex-attractant pheromone to disrupt mating continued at the Tensed and Lone Mountain ponderosa pine test plantations. One year remains in the planned treatment effort.

The Forest Service Pest Management staff and the Idaho Department of Lands participated in a 1990 field experiment aimed at comparing the mechanics and efficacy of a newly developed AgriSense pheromone releaser with the standard Luretape®. Results indicated similar efficacy between the two. The AgriSense dispenser was easier and faster to attach to a tree than tying the Luretape®.

Cranberry Girdler Moth

Cranberry girdler moth pheromone traps deployed at the Coeur d'Alene nursery caught moths from June 13 to September 19. The peak catch occurred from July 12-18 when 1,171 moths were caught. The nursery beds were sprayed with diazinon, aimed against adult moths, on June 29 and with Dursban, aimed against larvae in the soil, on August 22. Out of over 25,500 seedlings examined during the fall 1990 and spring 1991 lifting operations, 2.3 percent were damaged by cranberry girdler moth larval feeding. The nursery decreased the amount of pesticide used this year, and although the amount of damage in 1990 increased from 1989, it is still within acceptable levels.

Cone and Seed Insects

The Moscow White Pine Arboretum was aerially sprayed with the insecticide Pydrin® on June 19 to control cone and seed insects. Low levels of damage caused by coneworms, cone moths, and an unknown adelgid were detected throughout the summer. An earlier spray date for better control of coneworms and cone moths may be considered next year. A total of 778 bushels of cones was collected in 1990. The 1991 crop is expected to be larger.

The Coeur d'Alene seed orchard was sprayed July 16-18 with Pounce® to control the western conifer seed bug. This insect is the major pest in the orchard. Other cone and seed insects detected in small numbers were coneworms and cone beetles. A total of 383 bushels was collected this year (with 70 more estimated left above a net retrieval test). The prediction for next year is approximately 600 bushels.

The Lone Mountain seed orchard produced 4.5 bushels in 1990. Light populations of pine bark adelgids and a pine tussock moth were found on the trees.

Balsam Woolly Adelgid

The balsam woolly adelgid continues to pose a threat to true firs throughout northern Idaho. Aerial surveys detected over 24,000 acres of dead, fading, and newly infested subalpine fir. Numerous other acres are infested with trees that are not yet showing symptoms. Most of the damage is occurring on the Clearwater and Nez Perce NFs and adjacent state and private lands. Considerable mortality was recently discovered on private land in the Craig Mountains south of Lewiston and in the Joseph Plains area south of the Salmon River. Tree mortality continues to be confined to subalpine fir although bole infections are occurring on grand fir of all ages. Gouting is still very prevalent on grand fir regeneration located adjacent to infested subalpine fir.

DISEASES

This narrative is divided into three sections. The first section describes unusual diseases and disease problems which have changed significantly during 1990. Most of our most damaging disease problems continue to cause widespread problems over much of the same area every year. Because their status has not changed significantly, they are only briefly mentioned in this section.

The second section of the narrative describes current projects dealing with root diseases, dwarf mistletoes, white pine blister rust, and nursery diseases.

The final portion is in table form summarizing all disease problems observed in 1990 with brief remarks describing location and severity.

STEM AND BRANCH DISEASES

Dwarf Mistletoes

Dwarf mistletoe management considerations are generally included in Forest plans, and emphasize management through conventional forest management practices. This is reducing the need for supplemental projects to sanitize previously harvested stands where infected trees remain and now threaten the new regeneration. Accomplishments for 1990 are reported in Table 5.

Table 5.--Dwarf Mistletoe Accomplishments - Southern Idaho 1990

National Forest	Presuppression	Treated Acres
Boise	0	350
Caribou	5,000	500
Challis	0	410
Payette	0	465
Salmon	0	220
Sawtooth	0	200
Targhee	0	1,000
TOTAL	5,000	3,145

ROOT DISEASES

Root diseases continue to be the primary disease concern at many northern Idaho locations and are becoming the subject of more studies. Please check the project summaries in the following pages for the current status of these projects.

Impacts may be more severe than assumptions made a few years ago, and losses may be greater than 5 percent of the trees each year in infected areas.

FOLIAGE DISEASES

Most needle casts were observed at low levels during 1990 in spite of a very moist April. However, this moist period may have provided the proper conditions for widespread damage from Diplodia. This common disease

appears to have become epidemic in parts of northern Idaho around Post Falls where many large ponderosa pines suffered from severe dieback of small branches.

Larch needle diseases (in conjunction with insects) continued to show up sporadically during aerial detection surveys.

VASCULAR WILTS

Dutch elm disease was detected for the first time in northern Idaho, when several trees were diagnosed in Moscow with this disease. An intensive survey of the town and surrounding areas found only two areas with infected trees. The diseased trees were quickly removed. Trenches were dug around adjacent elms on the University of Idaho campus to prevent additional spread through root grafts. These areas will be closely monitored in 1991 for any additional infections.

NURSERY and PLANTATION DISEASES

NEW AND UNUSUAL DISEASES

1. *Cylindrocarpon destructans* caused extensive, rapid mortality of container-grown whitebark pine at the Coeur d'Alene Nursery. This pathogen caused extensive decay of roots of seedlings that were several weeks to a few months old. The pathogen was not found at very high levels on bulk seed, but may have been spread during seedcoat scarification that preceded sowing.

This fungus was also associated with root decay of container-grown western white pine and lodgepole pine seedlings at the Nursery.

2. Meria needle cast caused by *Meria laricis* was extensive during the spring and early summer on bareroot 2-0 western larch and young trees in a tree improvement plantation at the Coeur d'Alene Nursery. Standard protectant applications of chlorothalonil were made, but cool, wet weather persisted during the infection period. The disease became much less noticeable when warm, dry weather finally became common in Coeur d'Alene.

3. *Mortierella* spp. were isolated at high frequencies from "moldy" lodgepole pine and Engelmann spruce seed at the Coeur d'Alene Nursery. However, high infection rates did not adversely affect seed germination and germinant establishment in bareroot beds.

4. *Armillaria ostoyae* became more damaging in several tree improvement plantations in Idaho. In particular, the Hobo Hill Plantation on the IPNFs was beginning to display extensive damage from this disease.

SUMMARY OF PATHOLOGY PROJECTS

ROOT DISEASES

Annosus root disease

An Annosus root disease study is in progress on the Nez Perce NF. Two pairs of stands in the grand fir habitat type series have been examined intensively; one pair on the Elk City RD and one on the Clearwater RD. Both pairs consist of a clearcut and an adjacent uncut stand. The occurence of Annosus root disease is being examined to determine the relative importance of spore infection vs. tree-to-tree spread. There are two "strains" (biological species) of Annosus root disease, and results indicate that infections are from the strain that attacks spruce and firs (but not pines). Information from both parts of this study will aid in making species management and stump treatment decisions where Annosus root disease is present.

Armillaria Root Disease

Commercial thinning appears to have "stirred up" Armillaria root disease in a Douglas-fir stand that has been monitored for 9 years. The stand is a high-quality Douglas-fir/ninebark habitat type on the Flathead IR, and averaged 55 years of age in 1979 when it was commercially thinned. Prior to thinning, the stand had about 3,960 cu. ft. per acre of volume. The commercial thinning was intended to remove about 30 percent of the volume including the least vigorous appearing trees. Volume after thinning was 2,617 cu. ft./A of vigorous looking trees with full crowns. Two years after thinning about 120 cu. ft./A was again visibly infected (4.7 percent of the total). During the third and fourth years after thinning, the mortality rate shot up to 8.7 percent of the total volume, and 21 percent of the volume was in diseased or dead trees. In June of 1989, 10 years after thinning, 35 percent of the cu. ft. volume that had been left was either diseased or dead. This represents 46 percent of the Douglas-fir volume and 53 percent of the trees. The majority of the remaining volume is in ponderosa pine and larch. Annual fluctuations in mortality rates are shown in Figure 6.

Fertilizer Study

The ten one-tenth-acre plots established in conjunction with the tree nutrition cooperative and Intermountain Research Station near Grangemont in 1988-89 were examined for changes. Plots were fertilized with nitrogen, potassium (two types), a combination of nitrogen and potassium or were left untreated.

All plots have at least one symptomatic tree, but this varied from 1-12 in 1989 (average of 4.7 trees) and from 1-13 in 1990 (average of 5.7). Seven plots have had at least one tree die since the plots were established, but there is no correlation with fertilizer treatment. Thirteen trees which have had no symptoms initially are now exhibiting symptoms and 25 of the original 43 with symptoms displayed an increase in symptoms (the other 19 trees with symptoms remained unchanged).

Armillaria/Phellinus Root Diseases

Permanent Plot Analysis

Analysis was completed on 15 years of data from permanent plots in 100-year-old root-diseased stands on the IPNFs (Fernan RD, Lonesome Creek Watershed). The analysis indicates that Douglas-fir was killed by root disease at a somewhat higher rate than grand fir. Stand volume in Douglas-fir was greatly reduced over the 15-year period; grand fir volume actually increased slightly. Commercial thinning increased the rate of Douglas-fir mortality and slightly decreased the rate for grand fir (Figure 7). This information should be viewed as preliminary since it came from only six stands at one location where both Phellinus and Armillaria were present. Nevertheless, Douglas-fir stands might be considered a higher risk than those stands comprised mainly of grand fir in areas where both pathogens are present.

Figure 6 Hellroaring commercial thinning
Mortality..Armillaria root disease in a 55 year-old Douglas-fir stand.

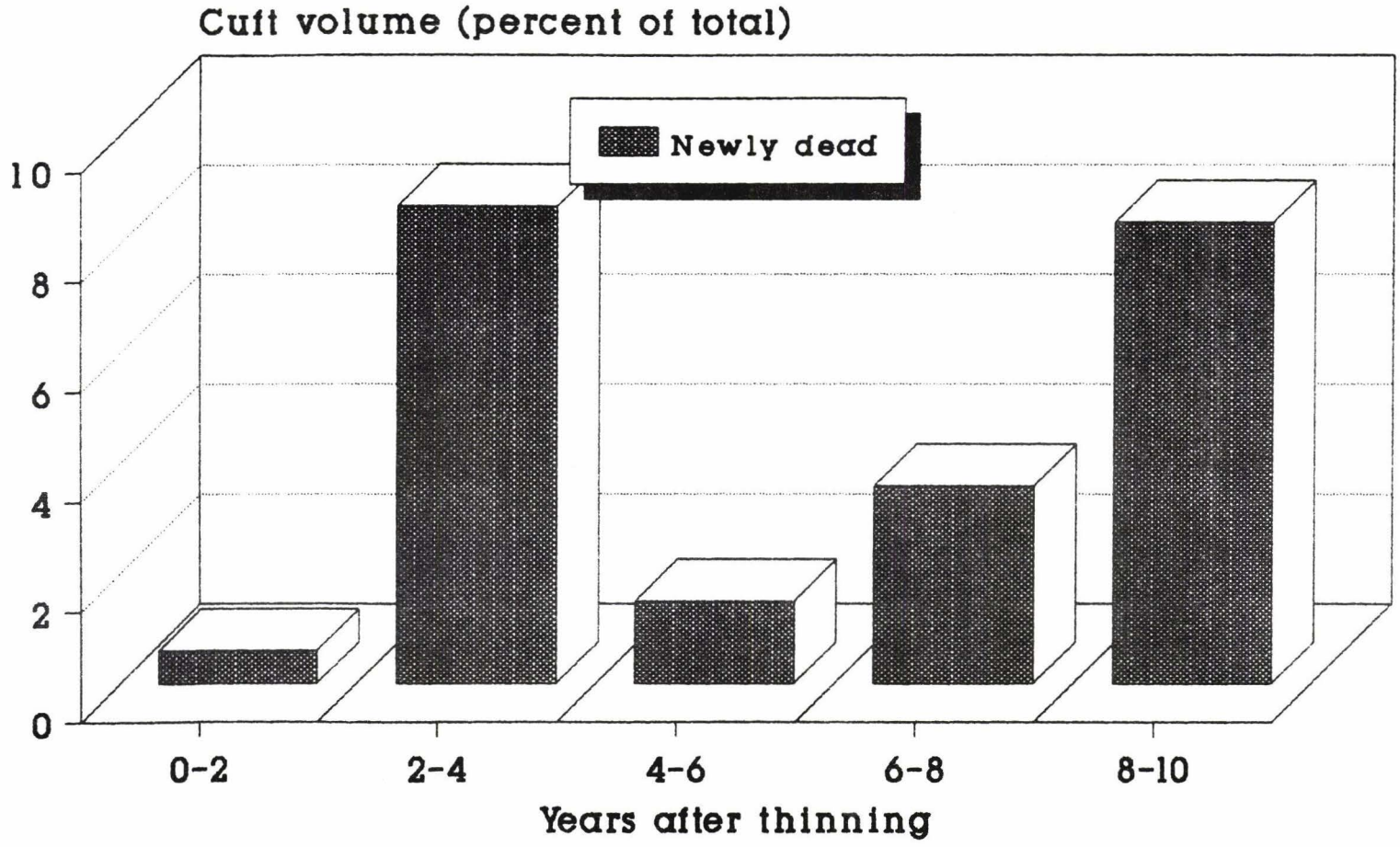
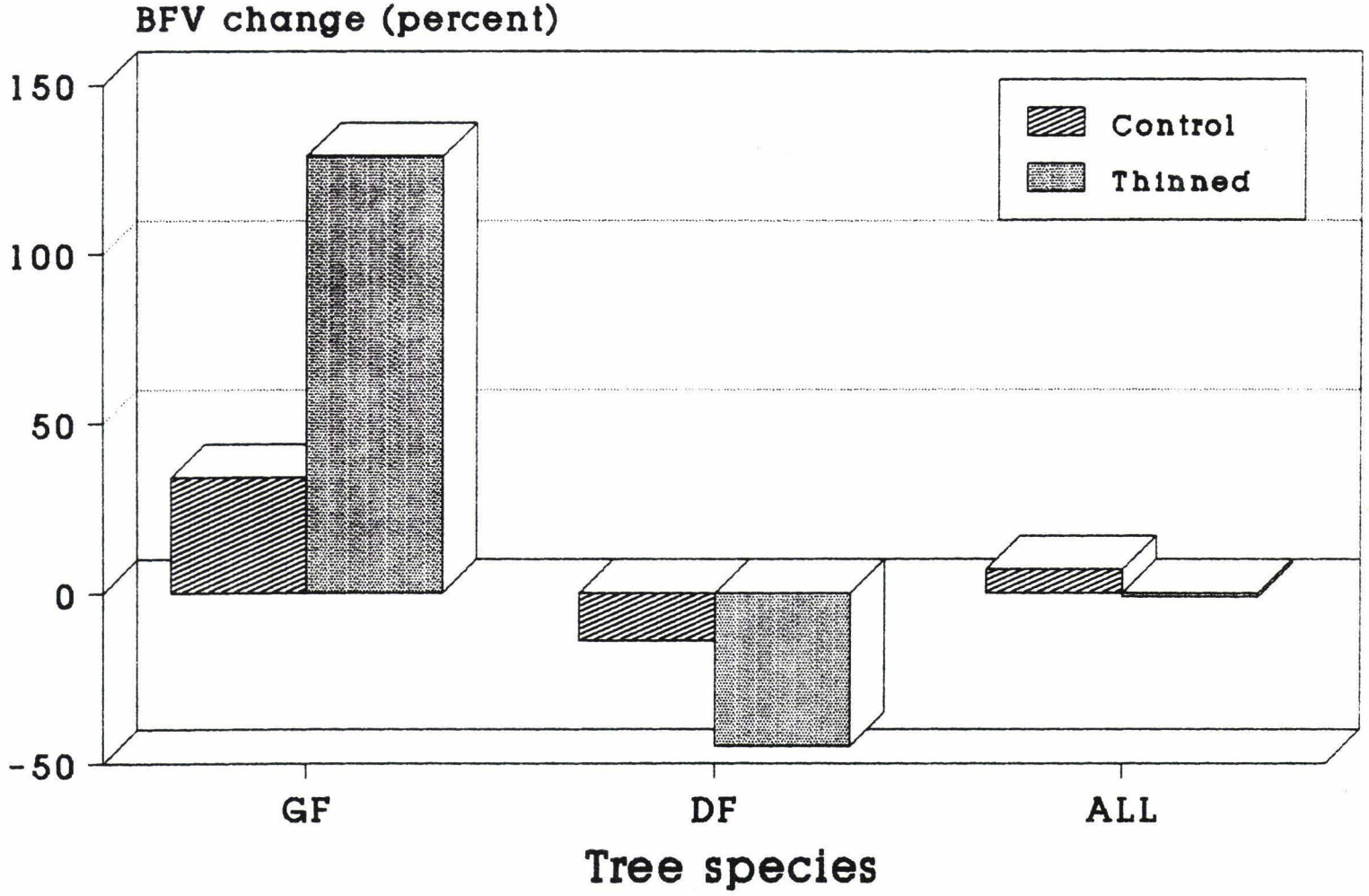


Figure 7. LONESOME CREEK VOLUME CHANGE

Boardfoot volume change in 15 years.



Average for two treatments (6 stands).

Surveys of 40- to 80-year-old Douglas-fir and grand fir stands in the Fernan RD have found root disease in stands thought to be relatively healthy. Three years after establishing random permanent plots, results indicate that these stands (Figure 8) may be on the same track as the older stands which have severe root disease problems. Risk-rating procedures under development may allow better management of the younger age classes.

Coeur d'Alene Basin Project

The IPNFs has undertaken a project to evaluate root disease on the Fernan and Wallace RDs with assistance from Regional pathologists. The goal is to assess the current status of root diseases in the Coeur d'Alene Basin and to develop management strategies for protection of the affected resources. Watershed and timber will be a major focus. We will identify sites which require concerted rehabilitation efforts to return them to productivity. We will monitor effects of disease on other sites which are less seriously affected. And we will develop an estimate of overall impact that root disease has had on the project area, and a prediction of the expected trends over the next few years. This should provide a good estimation of root-disease effects and the foundation for a proactive plan to achieve our resource goals in the Coeur d'Alene Basin forests.

Root Disease Model Update

The model has had some major improvements in recent months and is running better than ever. It can now be run locally on the Forest Service Data General system. However, certain default values need to be changed to produce results for this Region. Contact Sue Hagle to obtain a file of parameters needed or for other questions about running the root disease model.

Dwarf Mistletoes

Thinning Demonstration in Lodgepole Pine

Sixteen, 100-tree plots were established on the Targhee NF in 1983 to demonstrate the effect of dwarf mistletoe on lodgepole pine spaced to four different thinning regimes. The plots were remeasured in 1988, and analysis of the data is continuing.

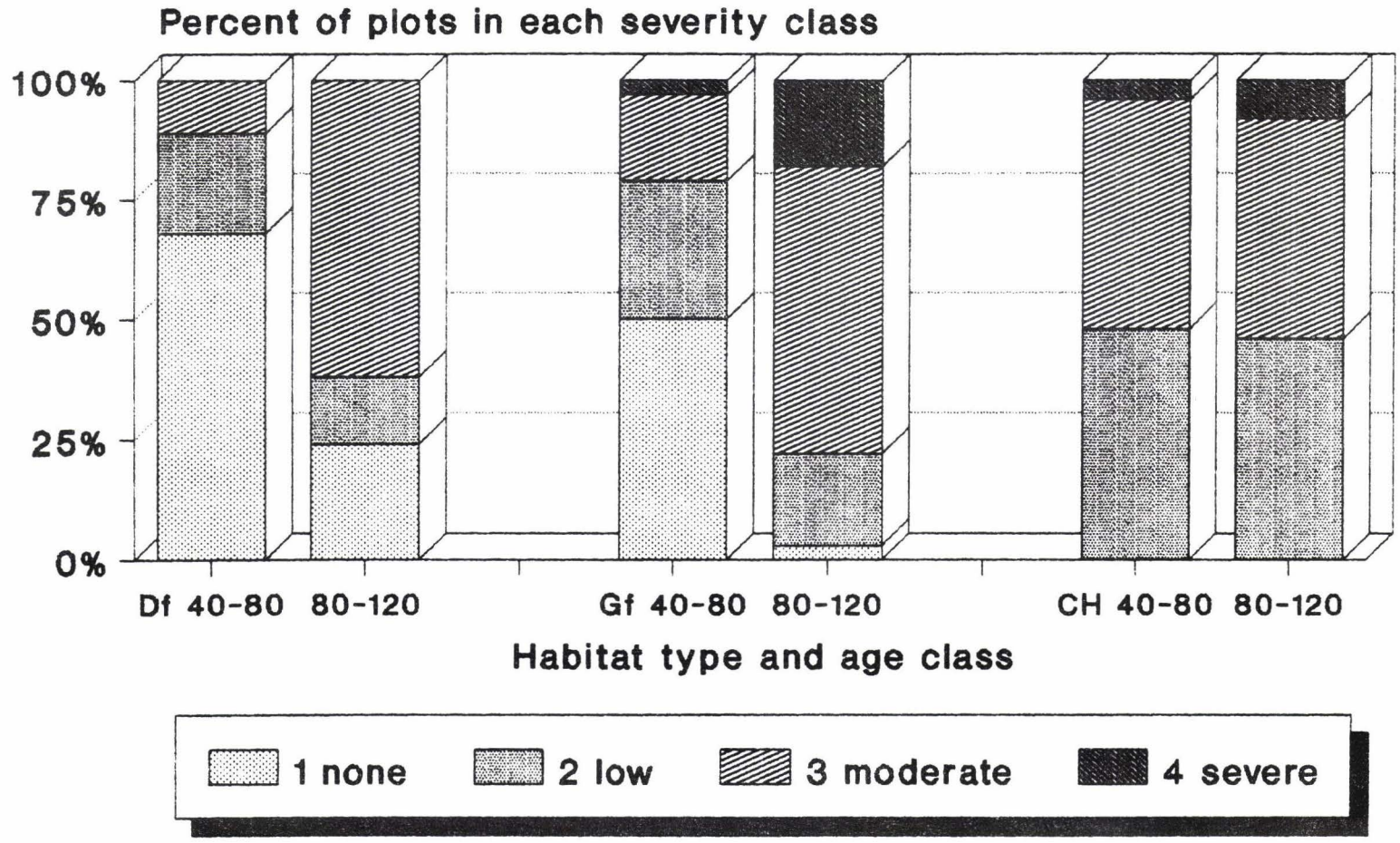
Dwarf Mistletoe Control with Ethephon

A 2-year study, conducted on the Emmett RD of the Boise NF, to determine the effectiveness of the growth regulator, ethephon, in causing dwarf mistletoe shoot abscission on ponderosa pine infections, was completed in 1989. Ethephon was fairly successful in killing shoots, but infections remained and began to resprout within a short period of time. The results are being printed as a research station note by the Pacific Northwest office in LaGrande, Oregon.

Dwarf Mistletoe Model

The Forest Pest Management Methods Application Group in Fort Collins is revising the existing PROGNOSIS-linked dwarf mistletoe model. Model revisions include modification of the spread and intensification equations and the addition of mortality functions. The revised version of the model is currently being tested by FPM and should be available for operational use late in 1991.

Figure 8. Root disease severity
Percent of plots by age class
Fernan RD



White Pine Blister Rust

Permanent plots were re-evaluated 5 years after pruning and excising cankers from a white pine plantation on the Palouse RD. The results were reassuring; the treated trees are growing well and their disease status appears to be stable. A year and a half after treatment, pruned trees were 98 percent free of infection and pruned and excised trees were 81 percent "clean." The 5-year remeasurements found less than 1 percent of the treated trees had new lethal cankers (cankers within 24 inches of the bole). A small mumber of the excisions that had been judged successful at 15 months, had actually failed (at least partially). This lowers the success rate for excisions to 78 percent from 81 percent. This is the first project in which permanent plots were established to monitor success, and additional plots are being established to monitor success in other areas.

Blister Rust Damage Model

A model to predict blister rust impact, developed by Geral McDonald of the Intermountain Research Station, was linked to PROGNOSIS. A workshop held in February provided suggestions for improvements which will be incorporated into the model during 1991.

NURSERY DISEASE PROJECTS

1. Evaluation of the fate of *Fusarium* spp. on outplanted container-grown Douglas-fir seedlings (in cooperation with the University of Idaho). Field work has been completed and the report is being prepared. Basically, *Fusarium* remained viable on roots of outplanted seedlings for three growing seasons. However, these fungi were mostly restricted to the old plug roots and did not readily colonize new, egressed roots during seedling growth. These fungi were not important causes of seedling mortality.

2. Evaluation of sodium metabisulfite and hot water to clean styroblock and plastic containers (in cooperation with the University of Idaho). Work continues to develop effective treatments to clean and remove potential pathogens from containers that are reused to grow several crops of seedlings.

3. Evaluation of *Gliocladium virens* to control root diseases of container-grown Douglas-fir seedlings (in cooperation with the University of Idaho). Work was completed during the 1990 growing season. Control effects were not evident, although data are currently being analyzed.

4. Biological control of *Fusarium oxysporum* by *Trichoderma harzianum* (in cooperation with the University of Idaho). *Trichoderma* isolates developed for their biocontrol potential on agricultural crops are being tested to control the common conifer nursery pathogen *Fusarium oxysporum*.

5. An evaluation of effects of different formulations of peat-vermiculite growing media on root pathogens of container-grown seedlings (at the USDA Forest Service Nursery, Coeur d'Alene, Idaho) will commence shortly.

STATUS OF CHRONIC DISEASE PROBLEMS

DISEASE	HOST	LOCATION/REMARKS
STEM AND BRANCH DISEASES		
Aspen trunk rot	Aspen	Common in most aspen stands (worse with age).
Atropellis canker	Lodgepole pine	Found in pockets in pole-sized stands causing defect, topkill, and mortality.
Comandra blister rust	Lodgepole and ponderosa pine	Heavy localized areas of infection resulting in branch, tip, and total tree mortality of sapling-sized trees in SE Idaho.
Cytospora canker	Subalpine fir	Symptoms and branch flagging in southern and eastern Idaho were less frequently observed than in 1989.
Diplodia blight	Ponderosa pine	Has been associated with branch dieback in many Idaho areas. Severity is increasing in northern Idaho.
Dwarf mistletoe	Douglas-fir, western larch, lodgepole and ponderosa pines	Widespread and damaging throughout the State; see Table 5 for summary of suppression projects.
Indian paint fungus (decay)	True firs, hemlock	Causes 90 percent of decay in these species; especially as age increases beyond 60 years.
Red ring rot	Western larch, pines, Douglas-fir, true firs, spruce	Serious decay problem in mature conifers.

Stalactiform rust	Lodgepole pine	Heavy infection has been observed in localized areas of the Salmon, Sawtooth, and Targhee NFs.
Western gall rust	Lodgepole and ponderosa pine	Occurs throughout range of hosts; infection levels are highly variable.
White pine blister rust	Western white pine, limber pine, whitebark pine	Continues to be a major mortality factor of naturally regenerated white pine and is becoming a major problem in subalpine pines.

ROOT DISEASES

Annosus root disease	Pines, true firs, Douglas-fir	Causes mortality, root and butt rot especially in young trees near old stumps; seems to be detected in more stands every year.
Armillaria root disease	Douglas-fir, grand fir	A widespread primary killer of Douglas-fir and true firs, and young trees of other species. May kill 5% of trees per year.
Black stain root disease	Pines, Douglas-fir	Found infrequently in northern Idaho; caused mortality of pinyon pine on the BLM Burley District in southern Idaho.
Laminated root rot	Douglas-fir, true firs, occasionally other conifers	Primary killer in many stands in northern Idaho; may be mixed with Armillaria or other root pathogens.
Schweinitzii root rot	Douglas-fir, pines	Common in mature and overmature forests; frequently associated with other root diseases and bark beetles.
Tomentosus root disease	Douglas-fir, spruce, subalpine fir	Commonly found with *P. schweinitzii* as a root/ butt rot in southern Idaho; occasionally causes mortality.

FOLIAGE DISEASES

Conifer-Aspen rust Conifer-Cottonwood rust	Aspen, conifers, cottonwood	Commonly observed in southern Idaho on hardwood hosts; some clones were severely defoliated.
Rhabdocline needle cast	Douglas-fir	Very widespread but very light levels Statewide.
Swiss needle cast	Douglas-fir	Widespread but low levels of infection throughout range of Douglas-fir in northern Idaho.
Elytroderma needle cast	Ponderosa pine	Widespread throughout the State but more prevalent in drier climates; less prevalent than in 1989.
Fir broom rust	True firs	Widespread throughout the State; usually of little consequence but severely infected stands were observed south of Twin Falls and Burley, in southern Idaho
Fir needle cast	Sublapine fir Grand fir	Infection was widespread but with low intensity throughout the host range.
Fir needle rust	Subalpine fir	Heavy infections were observed in small trees in high elevations around McCall.
Larch needle cast and blight	Larch	Both diseases occur throughout Idaho; relatively low incidence in 1990 except nurseries and localized areas in northern Idaho where mixed with insect problems.
Lodgepole pine needle cast	Lodgepole pine	Observed only in scattered areas of light intensity throughout the State in 1990.

Marssonina blight and Shepard's Crook	Aspen	Scattered incidence of moderate to heavy intensity throughout most of host range in southern Idaho.
Spruce broom rust	Engelmann spruce	Scattered through host range; most common in eastern Idaho.

NURSERY DISEASES

Cylindrocarpon	Especially white pine	Common in soil or contaminated containers, usually a saprophyte but may be a weak parasite.
Diplodia tip blight	Especially pines	Low levels in areas with a history of problems.
Fusarium root disease	Douglas-fir, larch, spruce others	Very common nursery problem; may be carried on soil or containers; minor mortality of 1-0 and 2-0 conifer seedlings at Lucky Peak Nursery.
Fusarium cortical stem rot	Abies spp., Douglas-fir Ponderosa pine	Caused minor mortality of 1-0 conifer seedlings at Lucky Peak.
Grey mold	Most conifers, especially larch, spruce	Common at low levels at many nurseries.
Larch needle cast	Larch	Caused extensive damage at the Coeur d'Alene nursery during early spring.
Phoma blight	Most pines	Found on seedlings and soil isolations at Lucky Peak Nursery.
Phytophthora/pythium root rot	Spruce, Douglas-fir	Found on bareroot spruce in poorly drained areas causing above-normal mortality and wilting of 2-0 seedlings.
Sirococcus tip blight	Spruce, pines	Low levels at several nurseries.

APPENDIX

COMMON AND SCIENTIFIC NAMES
of
INSECTS AND DISEASES

Insects

Common Name	*Scientific Name*
Balsam woolly adelgid	*Adelges piceae* (Ratzeburg)
Boxelder leafroller	*Caloptilia negundella* Chambers
Cone beetle	*Conophthorus ponderosae* Hopkins
Cone moth	*Eucosma recissoriana* Heinrich
Coneworm	*Dioryctria abietivorella* (Grote)
Cranberry girdler moth	*Chrysoteuchia topiaria* (Zeller)
Douglas-fir beetle	*Dendroctonus pseudotsugae* Hopk.
Douglas-fir tussock moth	*Orgyia pseudotsugata* McDunnough
Fir engraver	*Scolytus ventralis* LeConte
Fir root bark beetle	*Pseudohylesinus granulatus* (LeConte)
Gypsy moth	*Lymantria dispar* (L.)
Mountain pine beetle	*Dendroctonus ponderosae* Hopk.
Pine butterfly	*Neophasia menapia* (Felder & Felder)
Pine engraver	*Ips pini* (Say)
Ponderosa pine needleminer	*Coleotechnites moreonella* (Heinrich)
Silver fir beetle	*Pseudohylesinus sericeus*
Spruce beetle	*Dendroctonus rufipennis* (Kirby)
Western conifer seedbug	*Leptoglossus occidentalis* Heidmann
Western pine beetle	*Dendroctonus brevicomis* LeConte
Western pine shootborer	*Eucosma sonamana* Kearfott
Western spruce budworm	*Choristoneura occidentalis* Freeman

Diseases

Common Name	*Scientific Name*
Annosus root disease	*Heterobasidion annosum* (Fr.) Bref.
Armillaria root disease	*Armillaria ostoyae* (Romagn.) Herink
Atropellis canker	*Atropellis piniphila* (Weir) L. & H.
Black stain root disease	*Leptographium wagneri* (Kendr.) Wingf.
Comandra blister rust	*Cronartium commandrae* Pk.
Cylindrocarpon root disease	*Cylindrocarpon* spp.
Cytospora canker	*Cytospora abietis* Sacc.
Diplodia tip blight	*Sphaeroposis sapinea* (Fr.) Dyko
Dutch elm disease	*Ceratocystis ulmi* (Buism.) C. Mor.
Dwarf mistletoes	*Arceuthobium* spp.
Elytroderma needle cast	*Elytroderma deformans* (Weir) Dark.
Fir broom rust	*Melampsorella caryophyllacearum* Schroet.
Fusarium root disease	*Fusarium* spp.
Grey mold	*Botrytis cinerea* Pers. ex Fr.
Indian paint fungus	*Echinodontium tinctorum* (Ell. & Ev.) Ell. & Ev.
Laminated root rot	*Phellinus weirii* (Murr.) Gilb.
Lodgepole pine needle cast	*Lophodermella concolor* (Dearn.) Dark.
Larch needle blight	*Hypodermella laricis* Tub.
Larch needle cast	*Meria laricis* Vuill.
Phoma blight	*Phoma* spp.
Pythium root disease	*Pythium* spp.
Red ring rot	*Phellinus pini* Pilat.
Rhabdocline needle cast	*Rhabdocline psuedotsugae* Syd.
Schweinitzii root and butt rot	*Phaeolus schweinitzii* (Fr.) Pat.
Sirococcus tip blight	*Sirococcus strobilinus* Preuss.
Spruce broom rust	*Chrysomyxa arctostaphyli* Diet.
Stalactiform rust	*Cronartium coleosporioides* Arth.
Swiss needle cast	*Phaeocryptopus gaumanni* (Rhode) Pet.
Tomentosus root disease	*Inonotus tomentosus* (Fr.) Gilb.
Western gall rust	*Endocronartium harknessii* (Moore) Hir.
White pine blister rust	*Cronartium ribicola* Fisch.

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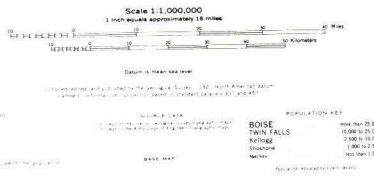
DOUGLAS-FIR BEETLE
WESTERN PINE BEETLE
PINE ENGRAVER BEETLE
MOUNTAIN PINE BEETLE
BALSAM WOOLLY ADELGID

1990

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF IDAHO

Scale 1:1,000,000
1 inch equals approximately 16 miles



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FIR ENGRAVER BEETLE
SPRUCE BEETLE
WESTERN SPRUCE BUDWORM
BALSAM BARK BEETLE

1990

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF IDAHO

Scale 1:1,000,000
1 inch equals approximately 16 miles

Datum is mean sea level

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Lambert conformal conic projection, standard parallels 33° and 45°

LEGEND

SOURCE DATA

BASE MAP

INDEX TO TOPOGRAPHIC MAPS

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Kellogg	1:250,000
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